

Atty. Docket No. 038867/284078

PCT

IN THE AUSTRALIAN PATENT OFFICE

Applicants: THE DEPARTMENT OF AGRICULTURE, WESTERN AUSTRALIA, *et al.*
International Appln. No.: PCT/IB2003/004645
Filed: 9 July 2003 (09.07.03)
Title: WHEAT PLANTS HAVING INCREASED RESISTANCE TO
IMIDAZOLINONE HERBICIDES

2 November 2004

Australian Patent Office
P.O. Box 200, Woden
Act 2606, Australia

RESPONSE TO FIRST WRITTEN OPINION
ON PRELIMINARY EXAMINATION

Sir:

This is in response to the Written Opinion dated October 21, 2004, from the International Preliminary Examining Authority ("IPEA"). Applicants have amended this application, as described more fully below, to overcome the defects noted in the Written Opinion and to place the claims in proper form. Applicants respectfully request reconsideration in light of these amendments and issuance of a favorable International Preliminary Examination Report.

In response to the Written Opinion, kindly substitute the enclosed replacement sheets for the corresponding original sheets in the above-identified application.

Explanation of Differences between the Replaced Sheets and the Replacement Sheets

In accordance with Sections V and VIII of the First Written Opinion, Applicants submit new claims 1-57 to replace original claims 1-56. To make this change, Applicants submit herewith new pages 38-46 in replacement of original pages 38 to 45. The new claims are fully supported by the disclosure and original claims.

In particular, new independent claims 1, 28, 50, and 55 correspond to, and are supported by, original claims 1, 26, 47, and 53, respectively, and the disclosure. These new claims have been submitted to address inventive step objections under Section V and certain

observations under Section VIII as discussed more fully below. These new independent claims are each directed to a plant, a method of using the plant, or a method of making the plant, wherein the plant comprises either one or both of the *Triticum aestivum* Imi1 or Imi3 nucleic acids which encode an IMI polypeptide which comprises a mutation in Domain E that results in a serine to asparagine substitution in the IMI protein as compared to a wild-type AHAS protein. Support for these new claims can be found in original claims 1-7, 26-32, 47-49, and 53-55.

The new claims include two additional independent claims. New independent claims 22 and 44 are directed to a wheat plant and triticale plant, respectively, comprising the herbicide resistance characteristics of the plant with ATCC Patent Deposit Designation Number PTA-4256 or PTA-4257. These new claims are supported by original claims 15-18 and the disclosure, particularly on pages 4, 5, 10, 11, and 14.

Original claims 2, 16-18, 27, 48, and 54 are cancelled. It is noted, however, that the subject matter of original claims 2, 27, 48, and 54 is encompassed by new claims 1, 28, 50, and 55, respectively, and the subject matter of original claims 15-18 is encompassed by new claim 22.

New claim 4 was added to clarify that the plant of claim 1 can comprise at least one additional *Triticum aestivum* IMI nucleic acid selected from the group consisting of an Imi1 nucleic acid, an Imi2 nucleic acid, and an Imi3 nucleic acid. This new claim is supported by original claims 1 and 2.

New claims 5-19 correspond to the original claims 5-14 and 19-23, respectively. Each of these new claims is either identical to the corresponding original claim or has been modified for formal reasons, such as, for example, to renumber, to maintain antecedent basis, and/or to alter claim dependency.

New claim 20, which corresponds to original claim 24, clarifies that the claimed seed comprises at least one of the *Triticum aestivum* Imi1 or Imi3 nucleic acids of the parent plant of base claim 1. New claim 21, which corresponds to original claims 25, lacks the IMI nucleic acid limitation of original claim 25. This limitation is redundant in view of new claim 20 from which it depends.

New claims 23-27 are supported by original claims 19-23. Applicants note that new claims 23-27 are identical to new claims 15-19 except that new claims 23-27 depend from claim 22, instead of claim 1.

New claims 29, 30, and 32-41 correspond to the original claims 28-39, respectively. Each of these new claims is either identical to the corresponding original claim or has been modified for formal reasons, such as, for example, to renumber, to maintain antecedent basis, and/or to alter claim dependency.

New claim 31 was added to clarify that the plant of claim 28 can comprise at least one additional *Triticum aestivum* IMI nucleic acid selected from the group consisting of an Imi1 nucleic acid, an Imi2 nucleic acid, and an Imi3 nucleic acid. This new claim is supported by original claims 26 and 27.

New claim 42, which corresponds to original claim 40, clarifies that the claimed seed comprises at least one of the *Triticum aestivum* Imi1 or Imi3 nucleic acids of the parent plant of base claim 1. New claim 43, which corresponds to original claim 41, lacks the IMI nucleic acid limitation of original claim 41. This limitation is redundant in view of new claim 42 from which it depends.

New claims 45-49 are unchanged from original claims 42-46 except for being renumbered.

New claims 51-54, 56, and 57 correspond to the original claims 49-52 and 55-56 respectively. Each of these new claims is either identical to the corresponding original claim or has been modified for formal reasons, such as, for example, to renumber, to maintain antecedent basis, and/or to alter claim dependency.

The Objections under Item V

The Written Opinion of IPEA is favorable for claims 1-56 with respect to novelty and industrial applicability. The Written Opinion is negative with respect to claims 1-7, 11-14, 19-32, 36-41, 47-49, 51, and 53-55 for inventive step.

Specifically, the Written Opinion asserts that inventive step is not acknowledged for these claims in light of either D1 (Newhouse *et al.*, 1992, *Plant Physiol.* 100:882-886) or D2 (EP 050816 B1). The Written Opinion indicates that the claims are not distinguished by specific technical features but are instead broadly drawn to imidazolinone-tolerant wheat and triticale plants comprising a Brookton or Kirchauff IMI nucleic acid. The Written Opinion indicates that D1 and D2 disclose the principle of breeding imidazolinone-tolerant wheat by incorporating *Triticum aestivum* IMI nucleic acids/mutated AHAS into a wheat plant and that

the prior art discloses IMI nucleic acids derived from the wheat cultivar Fidel. The Written Opinion asserts that the skilled artisan would predict that cultivars in addition to Fidel would harbor AHAS genes and imidazolinone-tolerant wheat would be generated from Brookton or Kirchauff by mutating the AHAS genes for the three wheat genomes. The Written Opinion further asserts that triticale derivatives are not inventive because it would be obvious to incorporate imidazolinone tolerance present in a wheat line into triticale.

Applicants submit new claims 1-57 to address the inventive step objections. Applicants submit that the new claims are directed to specific technical features. In particular, new independent claims 1, 28, 50, and 55 are directed to a plant comprising specific technical features. In each of these independent claims and their respective dependent claims, the plant comprises at least one *Triticum aestivum* IMI nucleic acid selected from the group consisting of (a) an Imi1 nucleic acid encoding an IMI polypeptide which comprises a mutation in Domain E that results in a serine to asparagine substitution in the IMI protein as compared to a wild-type AHAS protein, and (b) an Imi3 nucleic acid encoding an IMI polypeptide which comprises a mutation in Domain E that results in a serine to asparagine substitution in the IMI protein as compared to a wild-type AHAS protein. Similarly, new independent claims 22 and 44 and their respective claims are directed to a wheat or triticale plant comprising the herbicide resistance characteristics of the plant with ATCC Patent Deposit Designation Number PTA-4256 or PTA-4257.

Neither D1 nor D2, alone or in combination, teach or even suggest plants having the specific technical features as set forth in the new claims. Accordingly, new claims 1-57 are inventive over D1 and/or D2.

In view of the new claims and remarks, Applicants submit that the objections for lack of inventive step are overcome.

Certain Observations on the International Application under Item 8

The Written Opinion indicates that claims 1-7, 11-14, 19-32, 36, 38-41, 47-49, 51, and 53-55 are not supported by the disclosure. The Written Opinion indicates that the present application discloses two wheat lines having increased imidazolinone tolerance due to artificial mutagenesis of AHAS genes, particularly the Kirchauff IMI K-42 line with the Imi3 nucleic acid and the Brookton IMI BR-8 line with the Imi1 nucleic acid. The Written Opinion further indicates that the application provides support for the K-42 and BR-8 wheat

lines and wheat and triticale bred from the K-42 and BR-8 lines that have increased tolerance to imidazolinone due to the presence of the Kirchauff Imi3 gene as set forth in SEQ ID NO: 3 and/or the presence of the Brookton Imi1 as set forth in SEQ ID NO: 1. The Written Opinion asserts that the claims are not drawn to such subject matter. The Written Opinion further asserts that the sequences set forth in SEQ ID NOS: 1 and 3 are only partial sequences covering only domains B and E and therefore, claims drawn to mutations in domains A, C, and D are not supported.

As discussed above, new independent claims 1, 28, 50, and 55 and their respective dependent claims are directed to plants comprising at least one *Triticum aestivum* IMI nucleic acid selected from the group consisting of (a) an Imi1 nucleic acid encoding an IMI polypeptide which comprises a mutation in Domain E that results in a serine to asparagine substitution in the IMI protein as compared to a wild-type AHAS protein, and (b) an Imi3 nucleic acid encoding an IMI polypeptide which comprises a mutation in Domain E that results in a serine to asparagine substitution in the IMI protein as compared to a wild-type AHAS protein. Similarly, new independent claims 22 and 44 and their respective dependent claims are directed to a wheat or triticale plant comprising the herbicide resistance characteristics of the plant with ATCC Patent Deposit Designation Number PTA-4256 or PTA-4257. As is indicated in the disclosure on page 14, the seed deposits designated as PTA-4256 and PTA-4257 correspond to the Brookton IMI BR-8 and Kirchauff IMI K-42 lines, respectively. Accordingly, the new claims are properly supported by the disclosure.

Additionally, in contrast to the assertions of the Written Opinion regarding the lack of support for mutations in domains A, C, and D, Applicants submit that new claims 5 and 32 are supported by the disclosure as these claims are directed to subject matter that is encompassed by new independent claims 1 and 28 from which they depend, respectively. As discussed in detail above, new claims 1 and 28 are fully supported by the disclosure.

In view of the new claims and remarks, Applicants submit that the new claims are fully supported by the disclosure.

Submission of Sequence Listing

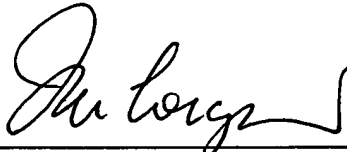
Applicants submit concurrently herewith paper and computer readable forms of the Sequence Listing. Although Applicants were not invited to furnish a Sequence Listing, the application contains one or more nucleotide and/or amino acid sequences. Applicants also

submit concurrently herewith a signed statement indicating that the Sequence Listing does not include matter which goes beyond the content of the application as filed and that the information recorded on the computer-readable form is identical to the paper Sequence Listing.

Accordingly, Applicants respectfully request that the Sequence Listing be made part of the international application.

Conclusion

All of the points raised by the IPEA in the first Written Opinion have now been addressed by clear and proper amendments to the claims of the pending application. Accordingly, Applicants respectfully request that a favorable International Preliminary Examination Report indicate the same.




The Department of Agriculture,
Western Australia *A/Director General
I. HARRISON.*

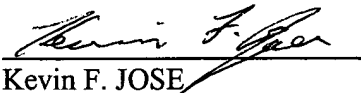


Iain BARCLAY

Respectfully submitted,



David BOWRAN



Kevin F. JOSE

ALSTON & BIRD LLP

Bank of America Plaza
101 South Tryon Street, Suite 4000
Charlotte, NC 28280-4000
Tel Raleigh Office (919) 862-2200
Fax Raleigh Office (919) 862-2260

CLAIMS

We claim:

1. A wheat plant comprising at least one *Triticum aestivum* IMI nucleic acid selected from the group consisting of:
 - (a) an Imi1 nucleic acid encoding an IMI polypeptide which comprises a mutation in Domain E that results in a serine to asparagine substitution in the IMI protein as compared to a wild-type AHAS protein; and
 - (b) an Imi3 nucleic acid encoding an IMI polypeptide which comprises a mutation in Domain E that results in a serine to asparagine substitution in the IMI protein as compared to a wild-type AHAS protein;wherein the *Triticum aestivum* IMI nucleic acid confers upon the plant increased tolerance to an imidazolinone herbicide as compared to a wild-type variety of the plant.
2. The wheat plant of claim 1, wherein the plant comprises the Imi1 nucleic acid of (a).
3. The wheat plant of claim 1, wherein the plant comprises the Imi3 nucleic acid of (b).
4. The wheat plant of claim 1, wherein the plant comprises a first *Triticum aestivum* IMI nucleic acid and a second *Triticum aestivum* IMI nucleic acid, the first *Triticum aestivum* IMI nucleic acid is the IMI nucleic acid of (a) or (b), and the second *Triticum aestivum* IMI nucleic acid is selected from the group consisting of an Imi1 nucleic acid, an Imi2 nucleic acid, and an Imi3 nucleic acid.
5. The wheat plant of claim 4, wherein the second *Triticum aestivum* IMI nucleic acid encodes an IMI polypeptide comprising a mutation in a conserved amino acid sequence selected from the group consisting of a Domain A, a Domain B, a Domain C, a Domain D and a Domain E.
6. The wheat plant of claim 5, wherein the conserved amino acid sequence is a Domain E.

SUBSTITUTE SHEET

7. The wheat plant of claim 6, wherein the mutation results in a serine to asparagine substitution in the second IMI protein as compared to a wild-type AHAS protein.

8. The wheat plant of claim 1, wherein the at least one *Triticum aestivum* IMI nucleic acid comprises a polynucleotide sequence selected from the group consisting of:

- (i) a polynucleotide as defined in SEQ ID NO:1;
- (ii) a polynucleotide as defined in SEQ ID NO:3;
- (iii) a polynucleotide encoding a polypeptide as defined in SEQ ID NO:2;
- (iv) a polynucleotide encoding a polypeptide as defined in SEQ ID NO:4;
- (v) a polynucleotide comprising at least 60 consecutive nucleotides of any of (i) through (iv) above; and
- (vi) a polynucleotide complementary to the polynucleotide of any of (i) through (v) above.

9. The wheat plant of claim 1, wherein the Imi1 nucleic acid comprises a polynucleotide sequence as defined in SEQ ID NO:1.

10. The wheat plant of claim 1, wherein the Imi3 comprises a polynucleotide sequence as defined in SEQ ID NO:3.

11. The wheat plant of any one of claims 1, 4, 5, 6, and 7, said plant comprising two *Triticum aestivum* IMI nucleic acids.

12. The wheat plant of claim 11, comprising an Imi1 nucleic acid and an Imi3 nucleic acid.

13. The wheat plant of any one of claims 1, 4, 5, 6, and 7, said plant comprising three *Triticum aestivum* IMI nucleic acids.

14. The wheat plant of claim 1, wherein the plant is not transgenic.

15. The wheat plant of claim 1, wherein the imidazolinone herbicide is selected from the group consisting of 2-(4-isopropyl-4-methyl-5-oxo-2-imidiazolin-2-yl)-nicotinic acid, 2-(4-isopropyl)-4-methyl-5-oxo-2-imidazolin-2-yl)-3-quinolinecarboxylic acid, 5-ethyl-

2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-nicotinic acid, 2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-5-(methoxymethyl)-nicotinic acid, 2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-5-methylnicotinic acid, and a mixture of methyl 6-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-m-toluate and methyl 2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-p-toluate.

16. The wheat plant of claim 1, wherein the imidazolinone herbicide is 5-ethyl-2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-nicotinic acid.

17. The wheat plant of claim 1, wherein the imidazolinone herbicide is 2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-5-(methoxymethyl)-nicotinic acid.

18. A plant part of the wheat plant of claim 1.

19. A plant cell of the wheat plant of claim 1.

20. A seed produced by the wheat plant of claim 1, wherein the seed comprises at least one *Triticum aestivum* IMI nucleic acid selected from the group consisting of the *Triticum aestivum* IMI nucleic acids of (a) and (b).

21. The seed of claim 24, wherein the seed is true breeding for an increased resistance to an imidazolinone herbicide as compared to a wild type variety of the wheat plant seed.

22. A wheat plant comprising the herbicide resistance characteristics of the plant with American Type Culture Collection (ATCC) Patent Deposit Designation Number PTA-4256 or PTA-4257, wherein:

- (a) the wheat plant has an ATCC Patent Deposit Designation Number PTA-4256 or PTA-4257;
- (b) the wheat plant is a recombinant or genetically engineered derivative of the plant with ATCC Patent Deposit Designation Number PTA-4256 or PTA-4257;
- (c) the wheat plant is any progeny of the plant with ATCC Patent Deposit Designation Number PTA-4256 or PTA-4257; or

SUBSTITUTE SHEET

- (d) the wheat plant is a progeny of any of the plants of (a) through (c).

23. The wheat plant of claim 22, wherein the imidazolinone herbicide is selected from the group consisting of 2-(4-isopropyl-4-methyl-5-oxo-2-imidiazolin-2-yl)-nicotinic acid, 2-(4-isopropyl)-4-methyl-5-oxo-2-imidazolin-2-yl)-3-quinolinecarboxylic acid, 5-ethyl-2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-nicotinic acid, 2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-5-(methoxymethyl)-nicotinic acid, 2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-5-methylnicotinic acid, and a mixture of methyl 6-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-m-toluate and methyl 2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-p-toluate.

24. The wheat plant of claim 22, wherein the imidazolinone herbicide is 5-ethyl-2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-nicotinic acid.

25. The wheat plant of claim 22, wherein the imidazolinone herbicide is 2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-5-(methoxymethyl)-nicotinic acid.

26. A plant part of the wheat plant of claim 22.

27. A plant cell of the wheat plant of claim 22.

28. A triticale plant comprising at least one *Triticum aestivum* IMI nucleic acid selected from the group consisting of:

- (a) an Imi1 nucleic acid encoding an IMI polypeptide which comprises a mutation in Domain E that results in a serine to asparagine substitution in the IMI protein as compared to a wild-type AHAS protein; and
- (b) an Imi3 nucleic acid encoding an IMI polypeptide which comprises a mutation in Domain E that results in a serine to asparagine substitution in the IMI protein as compared to a wild-type AHAS protein;

wherein the *Triticum aestivum* IMI nucleic acid confers upon the plant increased tolerance to an imidazolinone herbicide as compared to a wild-type variety of the plant.

29. The triticale plant of claim 28, wherein the triticale plant comprises the Imi1 nucleic acid of (a).

30. The triticales plant of claim 28, wherein the triticales plant comprises the Imi3 nucleic acid of (b).

31. The triticales plant of claim 28, wherein the triticales plant comprises a first *Triticum aestivum* IMI nucleic acid and a second *Triticum aestivum* IMI nucleic acid, the first *Triticum aestivum* IMI nucleic acid is the IMI nucleic acid of (a) or (b), and the second *Triticum aestivum* IMI nucleic acid is selected from the group consisting of an Imi1 nucleic acid, an Imi2 nucleic acid, and an Imi3 nucleic acid.

32. The triticales plant of claim 31, wherein the second *Triticum aestivum* IMI nucleic acid encodes an IMI polypeptide comprising a mutation in a conserved amino acid sequence selected from the group consisting of a Domain A, a Domain B, a Domain C, a Domain D and a Domain E.

33. The triticales plant of claim 32, wherein the conserved amino acid sequence is a Domain E.

34. The triticales plant of claim 33, wherein the mutation results in a serine to asparagine substitution in the second IMI protein as compared to a wild-type AHAS protein.

35. The triticales plant of claim 28, wherein the at least one *Triticum aestivum* IMI nucleic acid comprises a polynucleotide sequence selected from the group consisting of:

- (i) a polynucleotide as defined in SEQ ID NO: 1;
- (ii) a polynucleotide as defined in SEQ ID NO:3;
- (iii) a polynucleotide encoding a polypeptide as defined in SEQ ID NO:2;
- (iv) a polynucleotide encoding a polypeptide as defined in SEQ ID NO:4;
- (v) a polynucleotide comprising at least 60 consecutive nucleotides of any of (i) or (iv) above; and
- (vi) a polynucleotide complementary to the polynucleotide of any of (i) through (v) above.

36. The triticales plant of claim 28, wherein the Imi1 nucleic acid comprises a polynucleotide sequence as defined in SEQ ID NO:1.

37. The tritcale plant of claim 28, wherein the Imi3 nucleic acid comprises a polynucleotide sequence as defined in SEQ ID NO:3.

38. The tritcale plant of any one of claims 28, 31, 32, 33, and 34, said plant comprising two *Triticum aestivum* IMI nucleic acids.

39. The tritcale plant of claim 38, comprising a *Triticum aestivum* Brookton Imi1 nucleic acid and a *Triticum aestivum* Krichauff Imi3 nucleic acid.

40. A plant part of the tritcale plant of claim 28.

41. A plant cell of the tritcale plant of claim 28.

42. A seed produced by the tritcale plant of claim 28, wherein the seed comprises at least one *Triticum aestivum* IMI nucleic acid selected from the group consisting of the *Triticum aestivum* IMI nucleic acids of (a) and (b).

43. The seed of claim 42, wherein the seed is true breeding for an increased tolerance to an imidazolinone herbicide as compared to a wild type variety of the tritcale plant seed.

44. A tritcale plant comprising the herbicide resistance characteristics of the plant with ATCC Patent Deposit Designation Number PTA-4256 or PTA-4257, wherein:

- (a) the tritcale plant is a recombinant or genetically engineered derivative of the plant with ATCC Patent Deposit Designation Number PTA-4256 or PTA-4257;
- (b) the tritcale plant is any progeny of the plant with ATCC Patent Deposit Designation Number PTA-4256 or PTA-4257; or
- (c) the tritcale plant is a progeny of any of the plants of (a) through (b).

45. An isolated IMI nucleic acid, wherein the nucleic acid comprises a polynucleotide selected from the group consisting of:

- (a) a polynucleotide as defined in SEQ ID NO:1;

SUBSTITUTE SHEET

- (b) a polynucleotide as defined in SEQ ID NO:3;
- (c) a polynucleotide encoding a polypeptide as defined in SEQ ID NO:2;
- (d) a polynucleotide encoding a polypeptide as defined in SEQ ID NO:4;
- (e) a polynucleotide comprising at least 60 consecutive nucleotides of any of (a) through (d) above; and
- (f) a polynucleotide complementary to the polynucleotide of any of (a) through (e) above.

46. The isolated IMI nucleic acid of claim 45, wherein the nucleic acid comprises a polynucleotide as defined in SEQ ID NO:1.

47. The isolated IMI nucleic acid of claim 45, wherein the nucleic acid comprises a polynucleotide as defined in SEQ ID NO:3.

48. The isolated IMI nucleic acid of claim 45, wherein the nucleic acid comprises a polynucleotide encoding a polypeptide as defined in SEQ ID NO:2.

49. The isolated IMI nucleic acid of claim 45, wherein the nucleic acid comprises a polynucleotide encoding a polypeptide as defined in SEQ ID NO:4.

50. A method of controlling weeds within the vicinity of a plant, comprising applying an imidazolinone herbicide to the weeds and the plant, wherein the plant has increased tolerance to the imidazolinone herbicide as compared to a wild type variety of the plant, and wherein the plant comprises at least one *Triticum aestivum* IMI nucleic acid selected from the group consisting of:

- (a) an Imi1 nucleic acid encoding an IMI polypeptide which comprises a mutation in Domain E that results in a serine to asparagine substitution in the IMI protein as compared to a wild-type AHAS protein; and
- (b) an Imi3 nucleic acid encoding an IMI polypeptide which comprises a mutation in Domain E that results in a serine to asparagine substitution in the IMI protein as compared to a wild-type AHAS protein.

51. The method of claim 50, wherein the plant comprises an Imi1 nucleic acid and an Imi3 nucleic acid.

SUBSTITUTE SHEET

52. The method of claim 50, wherein the at least one *Triticum aestivum* IMI nucleic acid is selected from the group consisting of:
- (i) a polynucleotide as defined in SEQ ID NO:1;
 - (ii) a polynucleotide as defined in SEQ ID NO:3;
 - (iii) a polynucleotide encoding a polypeptide as defined in SEQ ID NO:2;
 - (iv) a polynucleotide encoding a polypeptide as defined in SEQ ID NO:4;
 - (v) a polynucleotide comprising at least 60 consecutive nucleotides of any of (i) through (iv) above; and
 - (vi) a polynucleotide complementary to the polynucleotide of any of (i) through (v) above.
53. The method of claim 50, wherein the plant comprises the Imi3 nucleic acid of (b).
54. The method of claim 50, wherein the at least one *Triticum aestivum* IMI nucleic acid is selected from the group consisting of:
- (i) a polynucleotide as defined in SEQ ID NO:3;
 - (ii) a polynucleotide encoding a polypeptide as defined in SEQ ID NO:4;
 - (iii) a polynucleotide comprising at least 60 consecutive nucleotides of any of (i) through (ii) above; and
 - (iv) a polynucleotide complementary to the polynucleotide of any of (i) through (iii) above.
55. A method of modifying a plant's tolerance to an imidazolinone herbicide comprising modifying the expression of at least one *Triticum aestivum* IMI nucleic acid selected from the group consisting of:
- (a) an Imi1 nucleic acid encoding an IMI polypeptide which comprises a mutation in Domain E that results in a serine to asparagine substitution in the IMI protein as compared to a wild-type AHAS protein; and
 - (b) an Imi3 nucleic acid encoding an IMI polypeptide which comprises a mutation in Domain E that results in a serine to asparagine substitution in the IMI protein as compared to a wild-type AHAS protein.

56. The method of claim 55, wherein the plant comprises an Imi1 nucleic acid and an Imi3 nucleic acid.

57. The method of claim 55, wherein the at least one IMI nucleic acid is selected from the group consisting of.

- (i) a polynucleotide as defined in SEQ ID NO:1;
- (ii) a polynucleotide as defined in SEQ ID NO:3;
- (iii) a polynucleotide encoding a polypeptide as defined in SEQ ID NO:2;
- (iv) a polynucleotide encoding a polypeptide as defined in SEQ ID NO:4;
- (v) a polynucleotide comprising at least 60 consecutive nucleotides of any of (i) through (iv) above; and
- (vi) a polynucleotide complementary to the polynucleotide of any of (i) through (v) above.

SUBSTITUTE SHEET